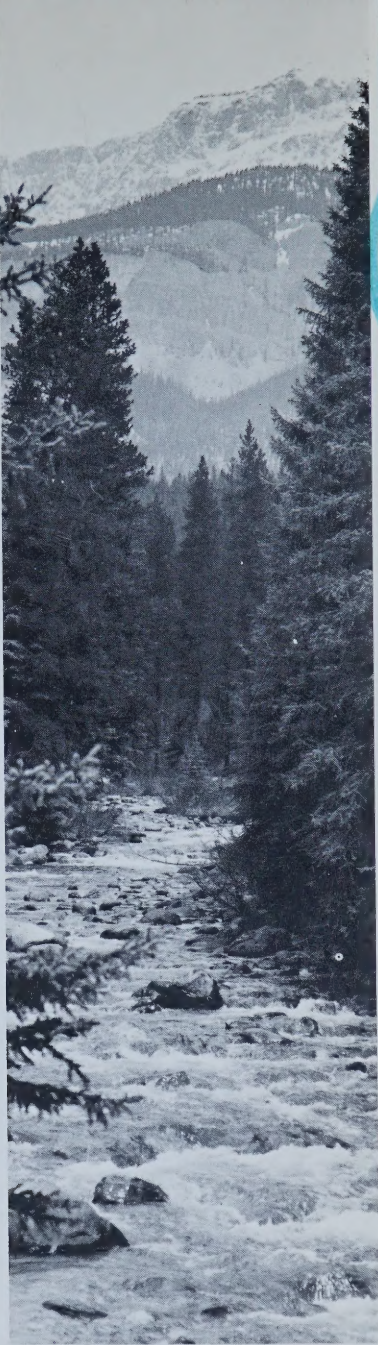


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Brule Water Supply. July 1974.



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BRULE WATER SUPPLY

ENVIRONMENTAL
PROTECTION
SERVICES

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DEPARTMENT OF THE ENVIRONMENT
ENVIRONMENTAL PROTECTION SERVICES

~~DEPARTMENT OF THE ENVIRONMENT~~

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JULY, 1974

SUBMITTED BY:

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GROUNDWATER

BRULE WATER SUPPLY

ABSTRACT

The water supply for the hamlet of Brule, as of June, 1974, appears to provide a sufficient quantity of potable water to satisfy the community's requirements. The winter months, however, may cause problems with the present system in the form of freezing the intake line and ice accumulation from the cistern overflow. The purpose of conducting this study was to determine if a well, which previously supplied the community's cistern, could be used to dispose of the cistern overflow. A pump test on the well indicates that it will take the overflow and can be left on standby should the other system fail due to frost. An additional advantage is that the water which is disposed of in the well will likely enhance the well water quality, should the well be required.

HAMLET OF BRULE WATER SUPPLY

The present water source for the Hamlet of Brule originates from Supply Creek, and is piped through a 1 inch plastic pipe for approximately 2050 feet to a 2700 gallon cistern, 146 feet lower in elevation than the water intake. The measured flow into the cistern is 7.5 igpm.

Overflow from the cistern causes little problem at present since water quickly infiltrates into the drift. In the winter months, however, the present system would be unsatisfactory.

Over a 24 hour period from 18:00 hrs., June 24, 1974 to 18:00 hrs., June 25, 1974 water was pumped from the cistern, down the well which, until recently, was the Hamlet's water supply. For this test 7200 gallons of water was removed from the cistern. The total daily input to the cistern, at 7.5 igpm for 1440 minutes, is 10,800 gallons.

During the 24 hours in which the pump test was conducted, an additional 1800 gallons was removed from storage in the cistern, giving a total water removal from the system of 12,600 gallons. 7200 gallons was pumped down the well, leaving 5400 gallons as the normal daily output of the cistern. The input to the cistern needed to sustain this rate would be 3.75 igpm, or one half of the present input. Assuming the 24 hour period of the test to be representative of the long term average water consumption of the community, it would be necessary to dispose of 3.75 igpm from the system. The reason for the pump test was to determine the acceptability of the abandoned well as a means of disposing of the excess 3.75 igpm; it would fill to approximately 10 feet (safe frost depth) in 11 1/2 months.

The ideal method of solving the cistern overflow problem is to limit the input to the amount used by the community. This could be accomplished by installing a float valve on the cistern end of the inlet hose. The problem of freezing in the winter, however makes this solution impractical. In fact, since the water in Supply Creek will be very near 0°C during the winter months, it is unlikely that the line would survive the winter without freezing even if insulated and allowed to flow. It should be considered that if the line is insulated yet still freezes, the insulation will hamper thawing in the spring. It is most likely that the well will have to be used in the winter months.

It is suggested that the cistern inlet be allowed to flow at 7 1/2 igpm during the summer months until there is a risk of freezing. The overflow from the cistern, via a buried line, could be drained into the well casing. Provision should be made for by-passing the overflow into a buried perforated culvert, should the flow into the casing need to be diverted. A float valve should also be installed on the inlet to the cistern to eliminate the overflow should the storage capacity of the well be less than expected. (See Figure I)

During the winter months, when the inlet from Supply Creek is out of service, and the well is again in use, the water from the well will be a mixture of the formation water and the injected water, improving the well water quality to some degree. Before the overflow is injected into the well, it should be chlorinated to eliminate the risk of contaminating the aquifer. Since public surface water supplies are required to be chlorinated, it is assumed that once the overflow injection into the well is commenced, the lack of chlorination on the hamlet's water supply will have been rectified.

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Regional groundwater movement in the area is downslope, to the east. The rate of movement, however, is virtually impossible to determine. The surface water injected into the aquifer will move away from the well bore to some extent, depending on the rate of groundwater movement. The amount of injected water recoverable and the length of time which it will have an improving effect on the well water can only be determined by trial.

QUANTITY OF WATER USED BY COMMUNITY

Capacity of cistern = 2,700 ig

Daily input to cistern = 10,800 ig (7.5 igpm for 1440 min.)

Quantity removed from cistern during test

$$\begin{aligned} &= 10,800 \text{ ig} \\ &\quad +1,800 \text{ ig (drawdown of reserve in cistern)} \\ &12,600 \text{ ig} \end{aligned}$$

Quantity pumped down well during test

$$= 7,200 \text{ ig (average 5 igpm for 1440 min.)}$$

$$\begin{aligned} \text{Quantity used by Community} &= 12,600 \\ &\quad -7,200 \\ &5,400 \text{ ig} \end{aligned}$$

PUMP TEST RESULTS

Length of test = 22 hr. (+2 1/2 hrs. recovery test)

Static water level = 87.21 feet below top of casing

Total raise in water level over 22 hrs.

$$= 34.13 \text{ feet}$$

Pumping rate - initial - 5.35 igpm
- final - 4 igpm
- assumed average - 5 igpm

ΔS = 30 feet (from data plot)

$$Q_{20} = \frac{S_a \times Q}{7 (\Delta S)} = \frac{75 \text{ ft.} \times 5.3 \text{ igpm}}{7 (30)} = 1.9 \text{ igpm}$$

The 20 year safe rate of pumping into the well would be 1.9 igpm.

$$T = \frac{264 \times 2}{\Delta S} = \frac{264 \times 5.3}{30} = 46.6$$

T (as calculated from pump test by driller Sept. 21 & 22, 1970) = 46

ΔS calculated for ($Q = 3.75$ igpm) - 21.0 ft./log cycle

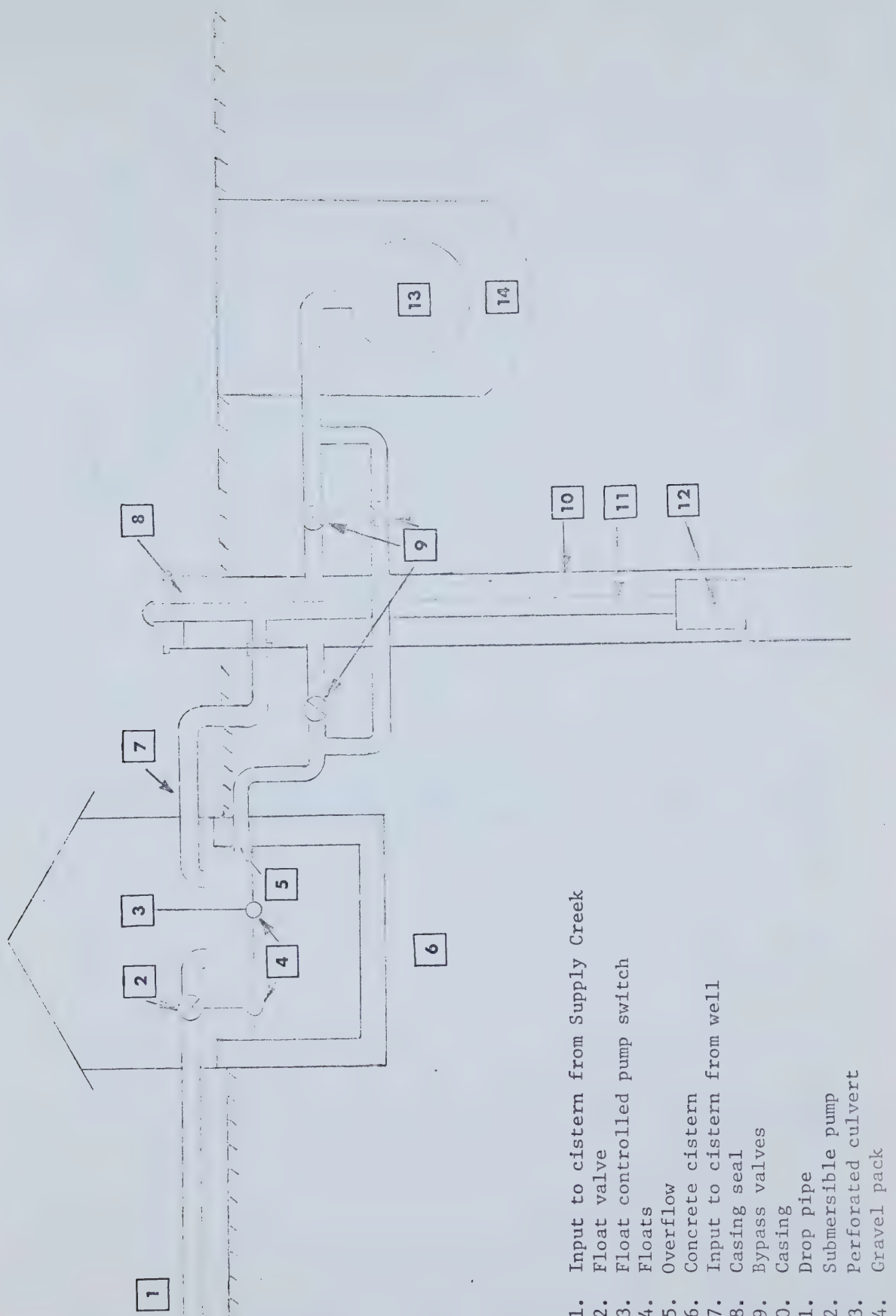
Projecting a slope at 21.0 ft. per log cycle on the data plot, a water level of 10 feet below casing top is reached at 500,000 minutes or approximately 11 1/2 months.

CONCLUSIONS

- The well will handle the overflow for 11 1/2 months.
- Chlorination may be required by the Department.
- The supply line will probably freeze in the winter.
- Installation of 13 & 14 on figure could be left for one year; by that time the effect of recharge will be known.

NOTE OF CAUTION

Sediment going into the well will reduce the wells capacity. This may happen during spring runoff and after summer storms. It may be possible to obtain permission to use the other intake at the stream which would reduce the chance of sediment laden water entering the system.



1. Input to cistern from Supply Creek
2. Float valve
3. Float controlled pump switch
4. Floats
5. Overflow
6. Concrete cistern
7. Input to cistern from well
8. Casing seal
9. Bypass valves
10. Casing
11. Drop pipe
12. Submersible pump
13. Perforated culvert
14. Gravel pack

PUMP TEST

ALBERTA DEPARTMENT OF THE ENVIRONMENT

WATER RESOURCES DIVISION
SOILS, GEOLOGY AND GROUNDWATER BRANCH

Water Level Measurements (field)

Well No. Well Owner: Dept. of Municipal Affairs Measured by: Prosser/Lesiuk

Location of project Brule Well location: Lsd. or ¼ 4. Sec. 15. Tp. 50. R. 27. Mer. W. 5.

Status R = Date June 24, 1974 Page 1/2

(distance from pumping well in feet and direction)

Date	Time hrs. & mins.	Elapsed time in mins.	Recovery		Depth to water in feet	Draw- down in feet	Q igpm	Drawdown in Cistern	Remarks (i.e. pumping rate, water temp., static level, etc.)
			t	t/t'					
June 24	19:00	0			87.21		5.35		
		1			85.29				Pumping rate could not be checked
		2			84.17				during test
		3			83.21				
		4			83.12				
		5			82.66				
		6			82.37				
		7			82.08				
		8			81.92				
		9			81.71				
		10			81.52				
		12			81.29				
		15			80.75				
		20			80.06				
		25			79.65				
		30			79.25				
		40			78.46				
		50			77.91				
	20:00	60			77.33				
		75			76.62				
		90			75.87			0.66	
		105			75.37				
	21:00	120			74.75				
		150			73.63				
	22:00	180			72.71				
		210			71.87				
June 24	23:00	240			70.87				

SOILS, GEOLOGY AND GROUNDWATER BRANCH

Status

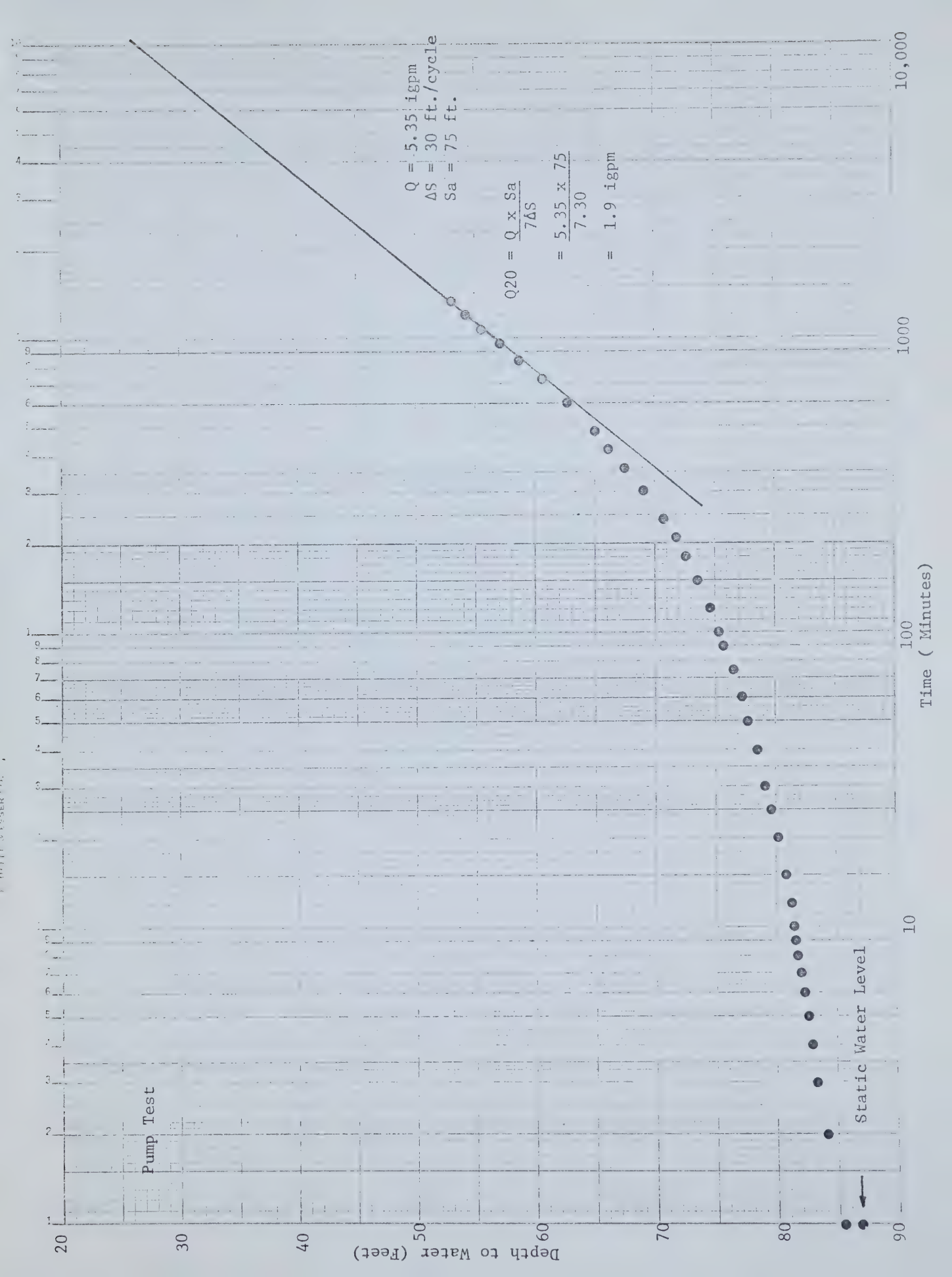
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ALBERTA DEPARTMENT OF THE ENVIRONMENT

Water Level Measurements (field)

Well No. Well Owner: Dept. of Municipal Affairs..... Measured by: Prosser/Lesiuk
 Location of project **Brule**..... Well location: Lsd. or $\frac{1}{4}$ 4..... Sec. 15..... Tp. 50..... R. 27..... Mer. W. 5.....
 Status R = Date June 25/74..... Page 1.....
 (pumping or observation well) (distance from pumping well in feet and direction)

[illegible]



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1/2 SEMILOGARITHMIC 48 6013
4 CYCLES X 75 DIVISIONS
KEUFFEL & ESSER CO.

1/2 SEMILOGARITHMIC 48 6013
4 CYCLES X 75 DIVISIONS
KEUFFEL & ESSER CO.

Pump Test

10 ft.

$Q=3.75$ lpgm
 $\Delta S=21.0$

$Q=5.35$
 $\Delta S=30$

Water Level
@ 1320 min
 $Q=5.35$ lpgm
(measured)

Water Level
@ 1320 min
 $Q=3.75$ lpgm
(calculated)

Static Water Level

15

30

45

60

75

90

